

FINAL REPORT

Evaluation of Larval Fish Density and Diversity within Main Channel and Main Channel Border Habitats of Pools 16, 20, and 22 of the Upper Mississippi River

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13. ABSTRACT (<i>Maximum 200 words</i>) Larval fish sampling was conducted on the Upper Mississippi River (UMR) within main channel and main channel border habitats of Pools 16, 20, and 22 from April 22 through July 17, 2002. Ichthyoplankton sampling resulted in the collection of 148,610 larval fish representing 14 taxa. Freshwater drum (<i>Aplodinotus grunniens</i>) and members of the family Cyprinidae were the dominant taxa in each pool. Mean larval fish densities were highest in June (2.77 fish/m ³) and lowest in the month of May (0.13 fish/m ³). Overall mean fish densities were similar among Pools 20 and 22 (1.54 and 1.37 fish/m ³ , respectively), while Pool 16 had a significantly lower overall density (0.71 fish/m ³).				
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List of Abbreviations and Acronyms

H'	Shannon-Wiener Diversity Index
IWW	Illinois Waterway
MC	main channel
MCB	main channel border
LDB	left descending bank
RDB	right descending bank
RM	River Mile
UMR	Upper Mississippi River
m	meter
m ³	cubic meter
cm	centimeter
mm	millimeter
District	U.S. Army Corps of Engineers – Rock Island District
GPS	Global Positioning System

1.0 Introduction

The U.S. Army Corps of Engineers, Rock Island District (District) is directed by Congress to maintain a 2.75 meter (m) (9-foot) navigation channel on the Upper Mississippi River (UMR) and Illinois Waterway (IWW). Maintenance of the navigation channel involves operating a series of Locks and Dams to maintain minimum pool elevations.

The Upper Mississippi River-Illinois Waterway System Navigation Study, ('Navigation Study') is a feasibility study addressing navigation improvement planning for the UMR and IWW navigation systems for the years 2000-2050. The study assesses the need for navigation improvements at 29 lock and dam facilities (35 locks) on the UMR and 8 locks on the IWW and the impacts of providing these improvements.

Navigation improvements associated with the Navigation Study would likely result in an increase in commercial navigation traffic in the UMR and IWW. This increase in navigation traffic could result in adverse impacts to fisheries communities of the UMR and IWW. One way that fisheries communities may be adversely affected is through propeller entrainment mortality of larval fish. To help characterize potential impacts from larval fish entrainment, the Corps has reviewed available data and has contracted with Harding ESE to conduct additional larval fish sampling to characterize larval fish drift within the UMR.

The purpose of this project is to evaluate larval fish density and diversity within the planktonic drift of main channel and main channel boarder habitats of Pools 16, 20, and 22 of the UMR. Primary tasks to be performed included:

- 1) Perform a series larval drift transect samples across main channel (MC) and main channel border (MCB) habitats of Pools 16, 20, and 22 of the Upper Mississippi River; and
- 2) Prepare a short technical report describing results of the survey. MC and MCB habitats are as defined in the Habitat Needs Assessment for the Upper Mississippi River Technical Report (Corps of Engineers 2000).

2.0 Methods and Materials

2.1 Field Sampling

Ichthyoplankton samples were collected on the UMR during the period April 22 through July 17, 2002. Sampling was performed once during April, twice per month during May and June, and once during July. Diurnal samples were collected during daylight hours (i.e., collection between 0900 and 1600 hours) during each sampling period. In addition to diurnal samples, nocturnal samples (i.e., collection between 2000 to 2400 hours) were taken during three sample periods (two in May, one in June) in the upper reach of each pool. For each sample period involving nocturnal sampling, 24-hour sampling was also performed within the upper reach of Pool 16. 24-hour samples were collected at 6-hour intervals over a period of one day, starting at 0600. The collection at 1200 hours during these sample periods doubled as the diurnal sample, and the collection at 2400 hours doubled as the nocturnal sample for Pool 16.

Sampling was performed along two transects each within Pools 16, 20, and 22 of the UMR. Each transect included one sample collected from the left descending main channel border, one sample from within the main channel, and one sample from the right descending main channel border (i.e., three samples per transect). In each pool, sampling was performed along one transect within the upper reach of the pool, and one transect from the lower reach. Samples were collected from transects at River Miles (RM) 478.0 and 462.2 in Pool 16, RM 360.4 and 344.5 in Pool 20, and RM 323.0 and 304.0 in Pool 22. In total, 153 samples were collected throughout the study.

Sampling was accomplished by towing paired 1-meter 500-micron mesh ichthyoplankton nets upstream approximately 10-cm below the water surface using a boom mounted to the bow of the boat. Each net was equipped with a General Oceanics 2030R Flowmeter to measure the volume of water passing through each net. Each tow was ten minutes in length while maintaining a velocity of 1.0 to 1.5 meters per second through the mouth of each net. A Garmin III Plus GPS was used to mark the starting location of each tow. Starting, middle, and end river depths were recorded for each sample tow. In addition, surface current velocity was measured with a Flowwatch digital meter; water temperature, dissolved oxygen, and pH were measured with a Hydrolab Minisonde unit; and turbidity was measured using a LaMotte Turbidimeter. Each water chemistry parameter was measured after each tow run at a depth of about 30 centimeters.

Each net was washed down from the open end to the collection bucket. The samples from each net were combined and measured to the nearest tenth (0.1) liter. Samples were then transferred into pre-labeled containers and preserved in 10 percent buffered formalin with rose bengal stain added. The samples were then transferred to Harding ESE's laboratory for processing.

2.2 Laboratory Processing

Upon return to the laboratory, samples were logged and entered into Harding ESE's sample tracking system. The samples were sorted by first washing each sample in a 500-micron sieve to remove excess formalin, rose bengal, and silt. A small portion of the sample was then placed in a white sorting pan and examined under a 2x-lighted magnifier. Using forceps, all fish (larvae, juveniles, and adults) were removed, enumerated, and placed in a pre-labeled jar containing 40% isopropyl alcohol. Sorting efficiency was monitored through quality assurance checks conducted by Harding ESE fisheries biologists and fisheries interns. Ten percent of the samples collected were checked for quality assurance. Harding ESE, Inc. Quality Assurance protocols mandate a 90 percent sorting efficiency to pass each lot of samples.

Larval fish were identified, enumerated, and measured using dissecting microscopes equipped with cross-polarized light. Ichthyoplankton taxonomic identifications were made to the lowest level possible (usually family) according to Hogue, et.al. (1976), Auer (1982), and Holland-Bartels (1999). Each taxonomist developed a reference collection containing a representative specimen of all species collected. Damaged or degraded specimens were placed in an unknown category. For each sample the first twenty-five fish of each species were randomly measured in total length to the nearest millimeter.

2.3 Data Analysis

Fish densities were calculated using the number of fish collected in a given sample, divided by the total volume of water sampled (No. fish/m³). MCB densities were calculated by taking total fish collected for the combined left descending bank (LDB) and right descending bank (RDB) and dividing by the total volume of water sampled. Mean fish densities were calculated by averaging the individual fish densities (Sum of Fish Densities/Number of Samples) or by averaging mean fish densities (Sum of Mean Fish Densities/Number of Samples). The Shannon-Wiener Diversity Index (H') was used to describe the diversity of taxa collected. This diversity index has two properties: (1) H' = 0 if and only if there is one species in a sample, and (2) H' is maximum only when all species are represented by the same number of individuals, that is, a perfectly even distribution of abundance. The Shannon-Wiener Diversity equation using natural logarithms is:

$$H' = -\sum_{i=1}^{S^*} (p_i \ln p_i) \quad (\text{Ludwig and Reynolds 1988}).$$

3.0 Results

3.1 Overview

Larval fish sampling on the UMR resulted in the collection of 153 samples that contained a total of 148,610 larval fish representing 14 different taxa (Table 1). In April, common carp, *Ictiobus/Carpiodes*, and Percidae were all common in collections. In May, common carp and *Ictiobus/Carpiodes* were still common, along with Hiodontidae. By June, freshwater drum and Cyprinidae became co-dominants, and this trend continued into July. Members of the family Clupeidae were also common in June. Uncommon or poorly represented taxa included channel catfish (*Ictalurus punctatus*), flathead catfish (*Pylodictis olivaris*), paddlefish (*Polydon spathula*), Cottidae, Esocidae and Lepisosteidae.

Results of individual samples collected are presented in Table 2, and include tow time, sample volume for each net, and fish abundance and density within each sample. Tow duration for each sample collected was generally held constant at 600 seconds throughout the sample period. The volume of water sampled by each net was generally similar between samples (approximately 413 m³ per net). Total sample volume (both nets combined) averaged 826.0 m³, with a range from a 424.1 m³ in Pool 16 in early June, to 1,083.6 m³ in Pool 16 in July. Low volumes were generally the result of heavy amounts of floating debris, reducing flow through the nets.

Overall, the mean density was 1.15 fish/m³ (Table 1). However, the density of fish collected was highly variable between sampling locations and dates. Mean larval fish densities within each pool and reach of pools generally remained low until a dramatic increase in June. Densities began to decline again during diurnal sampling in July. Density ranged from a low of 0.01 fish/m³ collected from a sample in Pool 16 in late May, to a high of 26.94 fish/m³ collected from a sample in Pool 20 in early June (Table 2).

3.2 Pool Summaries

Results from analyses of samples from each pool are presented in Table 3 for Pools 16, 20, and 22. In general, total mean densities of the combined collection from Pools 20 and 22 were relatively similar (1.54 and 1.37 fish/m³, respectively), while mean density in Pool 16 was lower (0.71 fish/m³). Shannon-Wiener Diversity Index and taxonomic richness values varied slightly between pools ranging from 9 taxa (Diversity = 1.08) in Pool 20 to 12 taxa (Diversity = 1.46) in Pool 16. Low diversity values from each of the pools were undoubtedly due to the high abundance of the two dominant taxa (freshwater drum, Cyprinidae).

Other taxa that were common in collections included *Cyprinus carpio*, *Ictiobus/Carpiodes* sp., Clupeidae, Percidae, Catostomidae, Centrarchidae, and Hiodontidae from Pool 16; Clupeidae, *Ictiobus/Carpiodes* sp., Hiodontidae, *Cyprinus carpio*, Catostomidae, and Percidae from Pool 20; and *Ictiobus/Carpiodes* sp., *Cyprinus carpio*, Catostomidae, Clupeidae, Percidae, and Hiodontidae from Pool 22.

3.3 Temporal and Spatial Results

3.3.1 Monthly Summary

A presentation of seasonal sampling results is provided in Table 4. June was the peak month for larval fish collection, as densities averaged 2.77 fish/m³ (>116,000 specimens collected for all pools combined). This result was consistent among the three pools sampled, although slightly lower in Pool 16. In Pools 20 and 22, mean fish density resulted in over 3.28 fish/m³ (>37,000 larval fish collected per pool), while in Pool 16, over 26,000 fish were collected resulting in a density of 1.46 fish/m³. Larval fish collection was lowest in May, as densities averaged 0.13 fish/m³ (<7,000 specimens collected). This result also was consistent among the three pools sampled. July yielded a high amount of larval fish among the three pools as overall density averaged 1.09 fish/m³ (>20,000 specimens collected), while April yielded low overall densities (0.34 fish/m³, <4,700 specimens collected). In order from the highest to lowest month for total mean larval fish density, results ranked as follows: June > July > April > May.

3.3.2 Diurnal/Nocturnal Sample Summary

For dates with both day and night sample collections, combined mean larval fish densities were slightly greater for samples collected during the daytime (overall mean density of 0.73 fish/m³) compared to those collected at night (overall mean density of 0.60 fish/m³; Table 5). However, differences did exist between pools. Within Pools 20 and 22, diurnal samples contained higher mean densities (0.88 and 0.83 fish/m³, respectively) than those for nocturnal samples (0.53 and 0.45 fish/m³, respectively). In contrast, Pool 16 had a greater mean nocturnal density (0.81 fish/m³) than mean diurnal density (0.47 fish/m³; Table 5). There were no considerable differences in species composition between day and night samples during the diurnal/nocturnal sample periods.

3.3.3 Twenty-Four Hour Summary

Temporal and spatial results of 24-hour sampling performed in the upper reach of Pool 16 are provided in Tables 6 through 8. Overall, 24-hour samples taken in June yielded a higher mean density (1.77 fish/m³) than samples taken in May (0.15 fish/m³; Table 6). For the two 24-hour sampling events during May, mean densities for all collection times remained relatively constant, ranging from 0.11 to 0.19 fish/m³ (Table 7). For the single 24-hour sampling event during June, mean densities increased considerably, with densities ranging from 1.19 fish/m³ for samples collected at 1200, to 2.04 fish/m³ for samples collected at 2400 (Table 8).

3.3.4 Spatial Summary

Monthly sampling results for the upper and lower reaches of each pool are presented in Table 9. Samples collected from the upper section of Pool 16 had higher mean densities in April and May relative to those within the lower pool, and lower mean densities in June and July. With the exception of Pool 22 in June, mean monthly densities for Pools 20 and 22 were higher for the upper pool reaches, compared to the lower pool reaches.

Table 10 compares spatial diurnal and nocturnal sampling results across each transect. For diurnal samples, the main channel border (MCB) yielded the highest total mean density (1.42 fish/m³), and the main channel (MC) was slightly lower (1.24 fish/m³). Densities were generally lower in the nocturnal samples. The MCB yielded the highest nocturnal density (0.69 fish/m³) and the MC resulted in a lower total mean density (0.26 fish/m³). It is important to restate that nocturnal sampling was only performed in the upper reaches of each pool.

Tables 7 through 8 present the summary of spatial sampling results for 24-hour sampling in Pool 16. May results yielded the highest average density in the MC (0.16 fish/m³; Table 7), Mean density within the MCB was 0.14 fish/m³. June results were considerably higher than May results (Table 8), with a density of 2.32 fish/m³ in the MC. MCB density was lower at 1.50 fish/m³.

Tables 11-19 provide detail regarding the trends in taxa density with respect to sample location within the channel. In this regard, the following general trends may be observed:

- ❑ Pool 16: densities within the lower pool were typically greatest within the MC,
- ❑ Pool 16: densities within the upper pool were generally greatest in collections taken from the MC,
- ❑ Pool 20: densities within the lower pool fluctuated among MC and MCB habitats, although the MC most frequently yielded the highest densities,
- ❑ Pool 20: densities within the upper pool were greatest in collections taken from the MCB,
- ❑ Pool 22: densities within the lower pool were typically greatest within the MCB, and
- ❑ Pool 22: densities within the upper pool were greatest in collections taken from the MCB.

Tables 20-22 present taxa density trends with respect to sample location for each collection time during the 24-hour sampling events. For each collection time, densities were generally greatest in collections taken from the MC.

3.4 Length Analysis

A representative number of individuals of each taxon were measured from each sample to provide information about trends in larval fish length and hence, developmental stage. Tables 23 to 25 present a summary of the mean lengths of fish specimens collected from each pool during each month.

In general, most larvae, regardless of date of collection or pool location, were found to have total lengths ranging from 5-10 mm. This is particularly true for most of the dominant taxa (i.e., freshwater drum, Cyprinidae, common carp, *Ictiobus/Carpiodes* sp., etc.). There were, however, a few notable exceptions to this general trend. For example, mean lengths of Hiodontidae were typically 8-16 mm, the one Lepisosteidae specimen collected had a length of 23 mm, and the one channel catfish (*Ictalurus punctatus*) specimen collected had a length of 21 mm. In addition, mean lengths of Clupeidae increased from 5-10 mm in April, May, and June to approximately 19 mm in July.

4.0 References

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Table 1. Mean total density of larval fish (expressed as No./m³) collected in Pools 16, 20, and 22 of the Upper Mississippi River, 2002.

Species	Mean Density (No./m ³)			
	April	May	June	July
Catostomidae	0.012	0.010	0.042	0.005
Centrarchidae	0.003	0.002	0.012	0.006
Clupeidae	0.001	0.001	0.091	0.015
Cottidae			0.002	
<i>Cyprinus carpio</i>	0.220	0.017	0.058	0.013
Cyprinidae	0.005	0.005	0.852	0.439
Esocidae		0.001		
Hiodontidae	0.003	0.033	0.009	
<i>Ictalurus punctatus</i>			0.001	
<i>Ictiobus/Carpionodes</i> sp.	0.059	0.070	0.052	0.003
Lepisostidae			0.001	
<i>Morone</i> sp.			0.011	
Percidae	0.051	0.011	0.008	0.001
<i>Polydon spathula</i>		0.002	0.001	
<i>Pylodictis olivaris</i>			0.001	
Sciaenidae			1.673	0.613
Unknown	0.010	0.005	0.018	0.005
Total Fish Collected	148,610			
Species Richness	14			
Mean Density	1.15			
Shannon-Wiener Diversity Index	1.29			

Table 2. Monthly density of larval fish (No. fish/m³) collected in Pools 16, 20, and 22 of the Upper Mississippi River, 2002.

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Sample Location	Sample ID	Date	Tow Time (Seconds)	Volume Sampled Net 1 (m ³)	Volume Sampled Net 2 (m ³)	No. Fish	Fish Density (No./m ³)
Diurnal							
Pool 16 - Upper	P16-UD-RDB	4/24/2002	600	345.50	340.86	1,028	1.50
Pool 16 - Upper	P16-UD-MC	4/24/2002	600	390.05	391.32	591	0.76
Pool 16 - Upper	P16-UD-LDB	4/24/2002	600	420.81	411.97	411	0.49
Diurnal							
Pool 16 - Lower	P16-LD-RDB	4/24/2002	600	399.93	407.77	354	0.44
Pool 16 - Lower	P16-LD-MC	4/24/2002	600	424.75	426.95	291	0.34
Pool 16 - Lower	P16-LD-LDB	4/24/2002	600	320.82	331.81	563	0.86
Diurnal							
Pool 20 - Upper	P20-UD-RDB	4/23/2002	600	426.40	415.41	256	0.30
Pool 20 - Upper	P20-UD-MC	4/23/2002	600	398.05	373.77	31	0.04
Pool 20 - Upper	P20-UD-LDB	4/23/2002	600	243.95	232.62	37	0.08
Diurnal							
Pool 20 - Lower	P20-LD-RDB	4/23/2002	600	402.90	423.57	97	0.12
Pool 20 - Lower	P20-LD-MC	4/23/2002	600	395.96	418.85	110	0.14
Pool 20 - Lower	P20-LD-LDB	4/23/2002	600	274.56	265.17	34	0.06
Diurnal							
Pool 22 - Upper	P22-UD-RDB	4/22/2002	600	449.37	482.22	274	0.29
Pool 22 - Upper	P22-UD-MC	4/22/2002	600	394.21	410.96	116	0.14
Pool 22 - Upper	P22-UD-LDB	4/22/2002	600	412.33	417.39	140	0.17
Diurnal							
Pool 22 - Lower	P22-LD-RDB	4/22/2002	600	456.02	456.48	312	0.34
Pool 22 - Lower	P22-LD-MC	4/22/2002	600	393.91	370.58	55	0.07
Pool 22 - Lower	P22-LD-LDB	4/22/2002	600	361.19	350.37	35	0.05
Mean Density (No./m³) for 4/24/02 Diurnal Sample Period							0.34

Diurnal = daytime sampling between 0900 and 1600 hours

Table 2. (cont.) Monthly density of larval fish (No. fish/m³) collected in Pools 16, 20, and 22 of the Upper Mississippi River, 2002.

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Sample Location	Sample ID	Date	Tow Time (Seconds)	Volume Sampled Net 1 (m ³)	Volume Sampled Net 2 (m ³)	No. Fish	Fish Density (No./m ³)
24-Hour Sampling							
Pool 16 - Upper	P16-UD-RDB(0600)	5/12/2002	600	285.31	288.80	152	0.26
Pool 16 - Upper	P16-UD-MC(0600)	5/12/2002	600	356.62	353.68	69	0.10
Pool 16 - Upper	P16-UD-LDB(0600)	5/12/2002	600	303.35	306.81	27	0.04
Diurnal 24-Hour Sampling							
Pool 16 - Upper	P16-UD-RDB(1200)	5/12/2002	600	333.54	341.05	187	0.28
Pool 16 - Upper	P16-UD-MC(1200)	5/12/2002	600	398.76	402.86	115	0.14
Pool 16 - Upper	P16-UD-LDB(1200)	5/12/2002	600	198.57	228.38	10	0.02
24-Hour Sampling							
Pool 16 - Upper	P16-UD-RDB(1800)	5/12/2002	600	402.44	406.09	313	0.39
Pool 16 - Upper	P16-UD-MC(1800)	5/12/2002	600	391.55	403.74	150	0.19
Pool 16 - Upper	P16-UD-LDB(1800)	5/12/2002	600	263.73	278.54	21	0.04
Nocturnal 24-Hour Sampling							
Pool 16 - Upper	P16-UN-RDB(2400)	5/13/2002	600	381.83	382.25	206	0.27
Pool 16 - Upper	P16-UN-MC(2400)	5/13/2002	600	404.06	417.46	180	0.22
Pool 16 - Upper	P16-UN-LDB(2400)	5/13/2002	600	198.17	236.46	35	0.08
Diurnal							
Pool 16 - Lower	P16-LD-RDB	5/11/2002	600	404.33	418.57	68	0.08
Pool 16 - Lower	P16-LD-MC	5/11/2002	600	426.65	437.90	77	0.09
Pool 16 - Lower	P16-LD-LDB	5/11/2002	600	359.59	365.75	43	0.06
Diurnal							
Pool 20 - Upper	P20-UD-RDB	5/10/2002	600	452.26	468.17	29	0.03
Pool 20 - Upper	P20-UD-MC	5/10/2002	600	439.56	440.11	34	0.04
Pool 20 - Upper	P20-UD-LDB	5/10/2002	600	378.83	402.14	113	0.14
Nocturnal							
Pool 20 - Upper	P20-UN-RDB	5/10/2002	600	441.38	455.07	69	0.08
Pool 20 - Upper	P20-UN-MC	5/10/2002	600	421.42	438.70	33	0.04
Pool 20 - Upper	P20-UN-LDB	5/10/2002	600	378.03	397.22	129	0.17

Diurnal = daytime sampling between 0900 and 1600 hours

Nocturnal = nighttime sampling between 2000 and 2400 hours

Diurnal 24-Hour Sampling = 24-hour samples taken during daytime (1200 hours)

Nocturnal 24-Hour Sampling = 24-hour samples taken during nighttime (2400 hours)

Table 2. (cont.) Monthly density of larval fish (No. fish/m³) collected in Pools 16, 20, and 22 of the Upper Mississippi River, 2002.

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Sample Location	Sample ID	Date	Tow Time	Volume Sampled	Volume Sampled	No. Fish	Fish Density
			(Seconds)	Net 1 (m ³)	Net 2 (m ³)	(No./m ³)	
Diurnal							
Pool 20 - Lower	P20-LD-RDB	5/10/2002	600	436.10	448.38	39	0.04
Pool 20 - Lower	P20-LD-MC	5/10/2002	600	452.58	459.31	65	0.07
Pool 20 - Lower	P20-LD-LDB	5/10/2002	600	368.81	397.86	51	0.07
Diurnal							
Pool 22 - Upper	P22-UD-RDB	5/8/2002	600	468.06	510.72	255	0.26
Pool 22 - Upper	P22-UD-MC	5/8/2002	600	487.66	497.91	38	0.04
Pool 22 - Upper	P22-UD-LDB	5/8/2002	600	475.43	487.98	27	0.03
Nocturnal							
Pool 22 - Upper	P22-UN-RDB	5/9/2002	600	473.95	479.67	516	0.54
Pool 22 - Upper	P22-UN-MC	5/9/2002	600	414.88	432.05	29	0.03
Pool 22 - Upper	P22-UN-LDB	5/9/2002	600	363.81	403.51	70	0.09
Diurnal							
Pool 22 - Lower	P22-LD-RDB	5/8/2002	600	459.31	467.77	296	0.32
Pool 22 - Lower	P22-LD-MC	5/8/2002	600	479.75	486.10	45	0.05
Pool 22 - Lower	P22-LD-LDB	5/8/2002	600	478.00	481.61	62	0.06
Mean Density (No./m ³) for 5/10/02 Diurnal/Nocturnal/24-Hour Sample Period							0.13

Diurnal = daytime sampling between 0900 and 1600 hours

Nocturnal = nighttime sampling between 2000 and 2400 hours

Table 2. (cont.) Monthly density of larval fish (No. fish/m³) collected in Pools 16, 20, and 22 of the Upper Mississippi River, 2002.

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Sample Location	Sample ID	Date	Tow Time	Volume Sampled	Volume Sampled	No. Fish	Fish Density
			(Seconds)	Net 1 (m ³)	Net 2 (m ³)	(No./m ³)	
24-Hour Sampling							
Pool 16 - Upper	P16-UD-RDB(0600)	5/21/2002	600	348.77	350.98	127	0.18
Pool 16 - Upper	P16-UD-MC(0600)	5/21/2002	600	356.07	375.07	131	0.18
Pool 16 - Upper	P16-UD-LDB(0600)	5/21/2002	600	432.37	445.79	20	0.02
Diurnal 24-Hour Sampling							
Pool 16 - Upper	P16-UD-RDB(1200)	5/21/2002	600	385.07	367.06	79	0.11
Pool 16 - Upper	P16-UD-MC(1200)	5/21/2002	600	348.66	328.92	82	0.12
Pool 16 - Upper	P16-UD-LDB(1200)	5/21/2002	600	440.36	431.10	9	0.01
24-Hour Sampling							
Pool 16 - Upper	P16-UD-RDB(1800)	5/21/2002	600	356.93	352.90	65	0.09
Pool 16 - Upper	P16-UD-MC(1800)	5/21/2002	600	354.13	337.15	123	0.18
Pool 16 - Upper	P16-UD-LDB(1800)	5/21/2002	600	362.52	412.43	42	0.05
Nocturnal 24-Hour Sampling							
Pool 16 - Upper	P16-UN-RDB(2400)	5/22/2002	600	410.54	405.43	272	0.33
Pool 16 - Upper	P16-UN-MC(2400)	5/22/2002	600	400.22	408.87	150	0.19
Pool 16 - Upper	P16-UN-LDB(2400)	5/22/2002	600	481.65	477.35	54	0.06
Diurnal							
Pool 16 - Lower	P16-LD-RDB	5/20/2002	600	323.24	341.93	74	0.11
Pool 16 - Lower	P16-LD-MC	5/20/2002	600	330.18	336.07	111	0.17
Pool 16 - Lower	P16-LD-LDB	5/20/2002	600	377.08	381.85	25	0.03
Diurnal							
Pool 20 - Upper	P20-UD-RDB	5/19/2002	600	409.40	402.56	72	0.09
Pool 20 - Upper	P20-UD-MC	5/19/2002	600	397.71	381.78	69	0.09
Pool 20 - Upper	P20-UD-LDB	5/19/2002	600	369.02	360.54	197	0.27
Nocturnal							
Pool 20 - Upper	P20-UN-RDB	5/19/2002	600	368.79	386.38	64	0.08
Pool 20 - Upper	P20-UN-MC	5/19/2002	600	381.53	374.25	64	0.08
Pool 20 - Upper	P20-UN-LDB	5/19/2002	600	356.38	340.94	280	0.40

Diurnal = daytime sampling between 0900 and 1600 hours

Nocturnal = nighttime sampling between 2000 and 2400 hours

Diurnal 24-Hour Sampling = 24-hour samples taken during daytime (1200 hours)

Nocturnal 24-Hour Sampling = 24-hour samples taken during nighttime (2400 hours)

Table 2. (cont.) Monthly density of larval fish (No. fish/m³) collected in Pools 16, 20, and 22 of the Upper Mississippi River, 2002.

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Sample Location	Sample ID	Date	Tow Time	Volume Sampled	Volume Sampled	No. Fish	Fish Density
			(Seconds)	Net 1 (m ³)	Net 2 (m ³)	(No./m ³)	
Diurnal							
Pool 20 - Lower	P20-LD-RDB	5/19/2002	600	336.66	343.96	17	0.02
Pool 20 - Lower	P20-LD-MC	5/19/2002	600	403.83	398.55	37	0.05
Pool 20 - Lower	P20-LD-LDB	5/19/2002	600	348.12	335.99	117	0.17
Diurnal							
Pool 22 - Upper	P22-UD-RDB	5/18/2002	600	394.88	404.36	137	0.17
Pool 22 - Upper	P22-UD-MC	5/18/2002	600	381.11	389.29	41	0.05
Pool 22 - Upper	P22-UD-LDB	5/18/2002	600	407.35	386.99	170	0.21
Nocturnal							
Pool 22 - Upper	P22-UN-RDB	5/18/2002	600	386.85	398.53	355	0.45
Pool 22 - Upper	P22-UN-MC	5/18/2002	600	388.60	389.84	25	0.03
Pool 22 - Upper	P22-UN-LDB	5/18/2002	600	421.51	395.12	86	0.11
Diurnal							
Pool 22 - Lower	P22-LD-RDB	5/18/2002	600	413.62	430.47	234	0.28
Pool 22 - Lower	P22-LD-MC	5/18/2002	600	390.37	389.27	43	0.06
Pool 22 - Lower	P22-LD-LDB	5/18/2002	600	362.84	356.53	51	0.07
Mean Density (No./m ³) for 5/20/02 Diurnal/Nocturnal/24-Hour Sample Period							0.14

Diurnal = daytime sampling between 0900 and 1600 hours

Nocturnal = nighttime sampling between 2000 and 2400 hours

Table 2. (cont.) Monthly density of larval fish (No. fish/m³) collected in Pools 16, 20, and 22 of the Upper Mississippi River, 2002.

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Sample Location	Sample ID	Date	Tow Time	Volume Sampled	Volume Sampled	No. Fish	Fish Density
			(Seconds)	Net 1 (m³)	Net 2 (m³)	(No./m³)	
Diurnal							
Pool 16 - Upper	P16-UD-RDB	6/5/2002	600	242.95	249.81	323	0.66
Pool 16 - Upper	P16-UD-MC	6/5/2002	600	243.80	251.65	316	0.64
Pool 16 - Upper	P16-UD-LDB	6/5/2002	600	195.51	276.67	175	0.37
Diurnal							
Pool 16 - Lower	P16-LD-RDB	6/5/2002	600	212.85	211.23	190	0.45
Pool 16 - Lower	P16-LD-MC	6/5/2002	600	278.12	288.69	1,626	2.87
Pool 16 - Lower	P16-LD-LDB	6/5/2002	600	210.81	214.18	140	0.33
Diurnal							
Pool 20 - Upper	P20-UD-RDB	6/4/2002	600	389.36	403.87	325	0.41
Pool 20 - Upper	P20-UD-MC	6/4/2002	600	442.26	439.23	5,029	5.71
Pool 20 - Upper	P20-UD-LDB	6/4/2002	600	373.96	360.35	19,782	26.94
Diurnal							
Pool 20 - Lower	P20-LD-RDB	6/4/2002	600	436.76	432.56	409	0.47
Pool 20 - Lower	P20-LD-MC	6/4/2002	600	417.73	413.89	699	0.84
Pool 20 - Lower	P20-LD-LDB	6/4/2002	600	517.15	496.84	10,514	10.37
Diurnal							
Pool 22 - Upper	P22-UD-RDB	6/3/2002	600	403.24	424.21	1,190	1.44
Pool 22 - Upper	P22-UD-MC	6/3/2002	600	404.38	418.21	1,746	2.12
Pool 22 - Upper	P22-UD-LDB	6/3/2002	600	474.45	438.72	2,523	2.76
Diurnal							
Pool 22 - Lower	P22-LD-RDB	6/3/2002	600	392.96	398.49	4,209	5.32
Pool 22 - Lower	P22-LD-MC	6/3/2002	600	344.49	357.90	9,523	13.56
Pool 22 - Lower	P22-LD-LDB	6/3/2002	600	353.35	350.46	7,509	10.67
Mean Density (No./m³) for 6/5/02 Diurnal Sample Period							4.77

Diurnal = daytime sampling between 0900 and 1600 hours

Table 2. (cont.) Monthly density of larval fish (No. fish/m³) collected in Pools 16, 20, and 22 of the Upper Mississippi River, 2002.

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Sample Location	Sample ID	Date	Tow Time (Seconds)	Volume Sampled Net 1 (m ³)	Volume Sampled Net 2 (m ³)	No. Fish	Fish Density (No./m ³)
24-Hour Sampling							
Pool 16 - Upper	P16-UD-RDB(0600)	6/20/2002	600	443.21	444.69	2,212	2.49
Pool 16 - Upper	P16-UD-MC(0600)	6/20/2002	600	414.92	422.31	2,582	3.08
Pool 16 - Upper	P16-UD-LDB(0600)	6/20/2002	600	328.22	346.70	156	0.23
Diurnal 24-Hour Sampling							
Pool 16 - Upper	P16-UD-RDB(1200)	6/20/2002	600	432.60	435.87	1,360	1.57
Pool 16 - Upper	P16-UD-MC(1200)	6/20/2002	600	392.52	426.32	1,299	1.59
Pool 16 - Upper	P16-UD-LDB(1200)	6/20/2002	600	449.60	455.87	372	0.41
24-Hour Sampling							
Pool 16 - Upper	P16-UD-RDB(1800)	6/20/2002	600	528.71	529.87	2,346	2.22
Pool 16 - Upper	P16-UD-MC(1800)	6/20/2002	600	499.41	501.79	2,336	2.33
Pool 16 - Upper	P16-UD-LDB(1800)	6/20/2002	600	509.79	501.25	1,208	1.19
Nocturnal 24-Hour Sampling							
Pool 16 - Upper	P16-UN-RDB(2400)	6/21/2002	600	519.30	509.68	2,986	2.90
Pool 16 - Upper	P16-UN-MC(2400)	6/21/2002	600	541.22	533.94	2,431	2.26
Pool 16 - Upper	P16-UN-LDB(2400)	6/21/2002	600	494.90	474.88	926	0.95
Diurnal							
Pool 16 - Lower	P16-LD-RDB	6/19/2002	600	446.65	452.92	1,516	1.69
Pool 16 - Lower	P16-LD-MC	6/19/2002	600	447.09	452.56	1,869	2.08
Pool 16 - Lower	P16-LD-LDB	6/19/2002	600	392.50	367.94	294	0.39
Diurnal							
Pool 20 - Upper	P20-UD-RDB	6/18/2002	600	487.98	516.22	3,404	3.39
Pool 20 - Upper	P20-UD-MC	6/18/2002	600	473.38	476.06	1,882	1.98
Pool 20 - Upper	P20-UD-LDB	6/18/2002	600	411.30	409.46	1,579	1.92
Nocturnal							
Pool 20 - Upper	P20-UN-RDB	6/18/2002	600	515.02	494.79	1,216	1.20
Pool 20 - Upper	P20-UN-MC	6/18/2002	600	497.98	500.06	1,200	1.20
Pool 20 - Upper	P20-UN-LDB	6/18/2002	600	414.76	421.99	1,247	1.49

Diurnal = daytime sampling between 0900 and 1600 hours

Nocturnal = nighttime sampling between 2000 and 2400 hours

Diurnal 24-Hour Sampling = 24-hour samples taken during daytime (1200 hours)

Nocturnal 24-Hour Sampling = 24-hour samples taken during nighttime (2400 hours)

Table 2. (cont.) Monthly density of larval fish (No. fish/m³) collected in Pools 16, 20, and 22 of the Upper Mississippi River, 2002.

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Sample Location	Sample ID	Date	Tow Time	Volume Sampled	Volume Sampled	No. Fish	Fish Density
			(Seconds)	Net 1 (m ³)	Net 2 (m ³)	(No./m ³)	
Diurnal							
Pool 20 - Lower	P20-LD-RDB	6/18/2002	600	439.25	457.83	2,487	2.77
Pool 20 - Lower	P20-LD-MC	6/18/2002	600	448.47	446.52	1,680	1.88
Pool 20 - Lower	P20-LD-LDB	6/18/2002	600	420.87	417.33	653	0.78
Diurnal							
Pool 22 - Upper	P22-UD-RDB	6/17/2002	600	413.81	437.31	1,662	1.95
Pool 22 - Upper	P22-UD-MC	6/17/2002	600	407.20	411.17	979	1.20
Pool 22 - Upper	P22-UD-LDB	6/17/2002	600	388.30	392.01	2,756	3.53
Nocturnal							
Pool 22 - Upper	P22-UN-RDB	6/17/2002	600	503.48	529.51	1,695	1.64
Pool 22 - Upper	P22-UN-MC	6/17/2002	600	454.20	452.90	167	0.18
Pool 22 - Upper	P22-UN-LDB	6/17/2002	600	439.52	414.92	847	0.99
Diurnal							
Pool 22 - Lower	P22-LD-RDB	6/17/2002	600	408.57	425.62	1,735	2.08
Pool 22 - Lower	P22-LD-MC	6/17/2002	600	382.90	397.69	550	0.70
Pool 22 - Lower	P22-LD-LDB	6/17/2002	600	330.08	335.77	728	1.09
Mean Density (No./m ³) for 6/19/02 Diurnal/Nocturnal/24-Hour Sample Period							1.68

Diurnal = daytime sampling between 0900 and 1600 hours

Nocturnal = nighttime sampling between 2000 and 2400 hours

Table 2. (cont.) Monthly density of larval fish (No. fish/m³) collected in Pools 16, 20, and 22 of the Upper Mississippi River, 2002.

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Sample Location	Sample ID	Date	Tow Time	Volume Sampled	Volume Sampled	No. Fish	Fish Density
			(Seconds)	Net 1 (m ³)	Net 2 (m ³)	(No./m ³)	
Diurnal							
Pool 16 - Upper	P16-UD-RDB	7/17/2002	600	540.42	528.40	639	0.60
Pool 16 - Upper	P16-UD-MC	7/17/2002	600	539.72	531.39	529	0.49
Pool 16 - Upper	P16-UD-LDB	7/17/2002	600	542.45	541.18	292	0.27
Diurnal							
Pool 16 - Lower	P16-LD-RDB	7/17/2002	600	542.47	503.02	771	0.74
Pool 16 - Lower	P16-LD-MC	7/17/2002	600	520.19	497.05	2,156	2.12
Pool 16 - Lower	P16-LD-LDB	7/17/2002	600	431.93	423.13	1,288	1.51
Diurnal							
Pool 20 - Upper	P20-UD-RDB	7/16/2002	600	517.07	520.59	639	0.62
Pool 20 - Upper	P20-UD-MC	7/16/2002	600	517.93	546.96	1,182	1.11
Pool 20 - Upper	P20-UD-LDB	7/16/2002	600	536.26	519.11	1,115	1.06
Diurnal							
Pool 20 - Lower	P20-LD-RDB	7/16/2002	600	512.85	509.49	210	0.21
Pool 20 - Lower	P20-LD-MC	7/16/2002	600	485.02	512.38	379	0.38
Pool 20 - Lower	P20-LD-LDB	7/16/2002	600	552.95	506.33	2,102	1.98
Diurnal							
Pool 22 - Upper	P22-UD-RDB	7/15/2002	600	527.89	531.33	1,750	1.65
Pool 22 - Upper	P22-UD-MC	7/15/2002	600	497.96	493.57	1,557	1.57
Pool 22 - Upper	P22-UD-LDB	7/15/2002	600	527.89	531.33	2,207	2.08
Diurnal							
Pool 22 - Lower	P22-LD-RDB	7/15/2002	600	536.37	516.50	1,548	1.47
Pool 22 - Lower	P22-LD-MC	7/15/2002	600	519.30	528.42	1,502	1.43
Pool 22 - Lower	P22-LD-LDB	7/15/2002	600	541.66	522.34	445	0.42
Mean Density (No./m ³) for 7/17/02 Diurnal Sample Period							1.09

Diurnal = daytime sampling between 0900 and 1600 hours

Table 3. Mean density of larval fish (No. fish/m³) collected in Pools 16, 20 and 22 of the Upper Mississippi River, 2002.

Species	Pool 16		Pool 20		Pool 22	
	Total Fish Collected	Mean Density (No./m ³)	Total Fish Collected	Mean Density (No./m ³)	Total Fish Collected	Mean Density (No./m ³)
Catostomidae	385	0.012	338	0.013	1,105	0.040
Centrarchidae	358	0.010	84	0.005	145	0.006
Clupeidae	819	0.036	2,938	0.137	820	0.041
Cottidae	1	0.002				
<i>Cyprinus carpio</i>	3,964	0.089	864	0.023	1,371	0.037
Cyprinidae	16,598	0.465	13,330	0.635	14,791	0.742
Esocidae	1	0.001				
Hiodontidae	346	0.014	679	0.032	657	0.027
<i>Ictalurus punctatus</i>					1	0.001
<i>Ictiobus/Carpionodes</i> sp.	2,635	0.059	1,766	0.051	2,244	0.058
Lepisostidae	1	0.001				
<i>Morone</i> sp.	115	0.007	187	0.015	117	0.013
Percidae	387	0.012	292	0.013	733	0.028
<i>Polydon spathula</i>	2	0.001	3	0.002	1	0.001
<i>Pylodictis olivaris</i>					1	0.001
Sciaenidae	12,709	0.565	39,115	2.183	27,780	1.627
Unknown	272	0.008	181	0.006	474	0.016
Total Fish Collected	38,593		59,777		50,240	
Species Richness	12		9		11	
Mean Density (No./m³)	0.71		1.54		1.37	
Shannon-Wiener Diversity Index	1.46		1.08		1.27	

Table 4. Summary of combined sampling results of larval fish in Pools 16, 20, and 22 of the Upper Mississippi River, 2002.

Location		April	May	June	July
Pool 16	Total Fish	3,238	3,017	26,663	5,675
	Mean Density (No. fish/m ³)	0.73	0.14	1.46	0.95
Pool 20	Total Fish	565	1,479	52,106	5,627
	Mean Density (No. fish/m ³)	0.12	0.11	4.09	0.89
Pool 22	Total Fish	932	2,480	37,819	9,009
	Mean Density (No. fish/m ³)	0.18	0.16	3.28	1.44
Total Fish		4,735	6,976	116,588	20,311
Mean Density (No. fish/m³)		0.34	0.13	2.77	1.09

Table 5. Summary of diurnal and nocturnal sampling results for dates with both diurnal and nocturnal sampling of larval fish in Pools 16, 20, and 22 of the Upper Mississippi River, 2002.

Location		Diurnal Sampling	Nocturnal Sampling
Pool 16	Total Fish	3,513	7,240
	Mean Density (No. fish/m ³)	0.47	0.81
Pool 20	Total Fish	7,379	4,302
	Mean Density (No. fish/m ³)	0.88	0.53
Pool 22	Total Fish	6,065	3,790
	Mean Density (No. fish/m ³)	0.83	0.45
Total Fish		16,957	15,332
Mean Density (No. fish/m³)		0.73	0.60

Table 6. Summary of temporal sampling results for 24-hour sampling of larval fish within the upper reach of Pool 16 of the Upper Mississippi River, 2002.

Collection Time		May	June	Total
0600	Total Fish	526	4,950	5,476
	Mean Density (No. fish/m ³)	0.13	1.94	0.73
1200	Total Fish	482	3,031	3,513
	Mean Density (No. fish/m ³)	0.11	1.19	0.47
1800	Total Fish	714	5,890	6,604
	Mean Density (No. fish/m ³)	0.16	1.91	0.74
2400	Total Fish	897	6,343	7,240
	Mean Density (No. fish/m ³)	0.19	2.04	0.81
Total Fish		2,619	20,214	22,833
Mean Density (No. fish/m ³)		0.15	1.77	0.69

Table 7. Summary of spatial sampling results for 24-hour sampling of larval fish within the upper reach of Pool 16 of the Upper Mississippi River, May 2002.

Collection Time	Location		
	Main Channel	Main Channel Border	Total
0600	Total Fish	200	326
	Mean Density (No. fish/m ³)	0.14	0.13
1200	Total Fish	197	285
	Mean Density (No. fish/m ³)	0.13	0.10
1800	Total Fish	273	441
	Mean Density (No. fish/m ³)	0.18	0.14
2400	Total Fish	330	567
	Mean Density (No. fish/m ³)	0.20	0.18
Total Fish		1,000	1,619
Mean Density (No. fish/m³)		0.16	0.14

Table 8. Summary of spatial sampling results for 24-hour sampling of larval fish within the upper reach of Pool 16 of the Upper Mississippi River, June 2002.

Collection Time		Location		
		Main Channel	Main Channel Border	Total
0600	Total Fish	2,582	2,368	4,950
	Mean Density (No. fish/m ³)	3.08	1.36	1.94
1200	Total Fish	1,299	1,732	3,031
	Mean Density (No. fish/m ³)	1.59	0.99	1.19
1800	Total Fish	2,336	3,554	5,890
	Mean Density (No. fish/m ³)	2.33	1.71	1.91
2400	Total Fish	2,431	3,912	6,343
	Mean Density (No. fish/m ³)	2.26	1.93	2.04
Total Fish		8,648	11,566	20,214
Mean Density (No. fish/m ³)		2.32	1.50	1.77

Table 9. Summary of temporal sampling results of larval fish within upper and lower reaches in Pools 16, 20, and 22 of the Upper Mississippi River, 2002.

Location		April	May	June	July	Total
Pool 16 - Upper	Total Fish	2,030	2,619	21,028	1,460	27,137
	Mean Density (No. fish/m ³)	0.92	0.15	1.26	0.45	0.64
Pool 16 - Lower	Total Fish	1,208	398	5,635	4,215	11,456
	Mean Density (No. fish/m ³)	0.55	0.09	1.30	1.45	0.80
Pool 20 - Upper	Total Fish	324	1,153	35,664	2,936	40,077
	Mean Density (No. fish/m ³)	0.14	0.13	4.92	0.93	1.81
Pool 20 - Lower	Total Fish	241	326	16,442	2,691	19,700
	Mean Density (No. fish/m ³)	0.11	0.07	2.85	0.86	1.13
Pool 22 - Upper	Total Fish	530	1,749	13,565	5,514	21,358
	Mean Density (No. fish/m ³)	0.20	0.17	1.76	1.77	0.88
Pool 22 - Lower	Total Fish	402	731	24,254	3,495	28,882
	Mean Density (No. fish/m ³)	0.15	0.14	5.57	1.11	2.11
Total Fish		4,735	6,976	116,588	20,311	148,610
Mean Density (No. fish/m³)		0.34	0.13	2.77	1.09	1.15

Table 10. Summary of spatial diurnal (daytime) and nocturnal (nighttime) sampling results of larval fish in Pools 16, 20, and 22 of the Upper Mississippi River, 2002.

Location		Diurnal Sampling		Nocturnal Sampling	
		Main Channel	Main Channel Border	Main Channel	Main Channel Border
Pool 16 - Upper	Total Fish	2,932	4,885	2,761	4,479
	Mean Density (No. fish/m ³)	0.62	0.52	1.02	0.81
Pool 16 - Lower	Total Fish	6,130	5,326	N/A	N/A
	Mean Density (No. fish/m ³)	1.28	0.56	N/A	N/A
Pool 20 - Upper	Total Fish	8,227	27,548	1,297	3,005
	Mean Density (No. fish/m ³)	1.49	2.94	0.44	0.57
Pool 20 - Lower	Total Fish	2,970	16,730	N/A	N/A
	Mean Density (No. fish/m ³)	0.56	1.42	N/A	N/A
Pool 22 - Upper	Total Fish	4,477	13,091	221	3,569
	Mean Density (No. fish/m ³)	0.85	1.21	0.08	0.64
Pool 22 - Lower	Total Fish	11,718	17,164	N/A	N/A
	Mean Density (No. fish/m ³)	2.64	1.85	N/A	N/A
Total Fish		36,454	84,744	4,279	11,053
Mean Density (No. fish/m³)		1.24	1.42	0.26	0.69

* LDB = Left Descending Bank

** MC = Main Channel

*** RDB = Right Descending Bank

Table 11. Diurnal (daytime) larval fish density expressed as No. fish/m³ for taxa collected during the April 24, 2002 sample period (+/- 3 days) in the Upper Mississippi River.

Pool 16				
Species	Lower		Upper	
	Main Channel	Main Channel Border	Main Channel	Main Channel Border
Catostomidae	0.004	0.010	0.003	0.001
Centrarchidae	0.001	0.004	0.001	0.003
Clupeidae				0.001
<i>Cyprinus carpio</i>	0.302	0.512	0.651	0.709
Cyprinidae	0.001	0.001		0.005
Hiodontidae		0.001		0.003
<i>Ictiobus/Carpionides</i>	0.018	0.064	0.081	0.187
Percidae	0.016	0.018	0.019	0.023
Unknown		0.019	0.001	0.016
Total Density (No./m³)	0.34	0.63	0.76	0.95

Pool 20				
Species	Lower		Upper	
	Main Channel	Main Channel Border	Main Channel	Main Channel Border
Catostomidae	0.054	0.012	0.013	0.014
Clupeidae				0.001
<i>Cyprinus carpio</i>	0.032	0.037	0.009	0.166
Cyprinidae	0.001	0.001		
Hiodontidae				0.001
<i>Ictiobus/Carpionides</i>	0.001	0.012		
Percidae	0.034	0.029	0.008	0.036
Unknown	0.012	0.005	0.010	0.005
Total Density (No./m³)	0.14	0.10	0.04	0.22

Pool 22				
Species	Lower		Upper	
	Main Channel	Main Channel Border	Main Channel	Main Channel Border
Catostomidae	0.009	0.017	0.016	0.003
Centrarchidae		0.001		
<i>Cyprinus carpio</i>	0.003	0.014	0.010	0.026
Cyprinidae		0.007		
<i>Ictiobus/Carpionides</i>	0.009	0.055	0.024	0.056
Percidae	0.043	0.118	0.072	0.144
Unknown	0.008	0.001	0.022	0.006
Total Density (No./m³)	0.07	0.21	0.14	0.24

Table 12. Diurnal (daytime) larval fish density expressed as No. fish/m³ for taxa collected during the May 10, 2002 sample period (+/- 3 days) in the Upper Mississippi River.

Pool 16				
Species	Lower		Upper	
	Main Channel	Main Channel Border	Main Channel	Main Channel Border
Catostomidae		0.002	0.031	0.049
Centrarchidae	0.001			0.003
<i>Cyprinus carpio</i>	0.009	0.007	0.011	0.006
Cyprinidae		0.016		0.001
Hiodontidae	0.001	0.003		0.042
<i>Ictiobus/Carpionodes</i>	0.065	0.035	0.066	0.054
Percidae	0.007	0.005	0.024	0.017
Unknown	0.006	0.003	0.011	0.007
Total Density (No./m³)	0.09	0.07	0.14	0.18

Pool 20				
Species	Lower		Upper	
	Main Channel	Main Channel Border	Main Channel	Main Channel Border
Catostomidae	0.015	0.005		0.004
<i>Cyprinus carpio</i>	0.020	0.015	0.009	0.009
Hiodontidae	0.004	0.010	0.001	0.011
<i>Ictiobus/Carpionodes</i>	0.023	0.013	0.022	0.040
Percidae	0.003	0.008	0.006	0.018
Unknown	0.005	0.004	0.001	0.002
Total Density (No./m³)	0.07	0.05	0.04	0.08

Pool 22				
Species	Lower		Upper	
	Main Channel	Main Channel Border	Main Channel	Main Channel Border
Catostomidae	0.006	0.006	0.001	0.010
Centrarchidae		0.003		
Clupeidae	0.001			
<i>Cyprinus carpio</i>	0.011	0.075	0.011	0.034
Cyprinidae		0.003		0.005
Hiodontidae		0.003	0.002	0.002
<i>Ictiobus/Carpionodes</i>	0.018	0.074	0.017	0.060
Percidae	0.007	0.020	0.005	0.027
Unknown	0.003	0.006	0.002	0.008
Total Density (No./m³)	0.05	0.19	0.04	0.15

Table 13. Nocturnal (nighttime) larval fish density expressed as No. fish/m³ for taxa collected during the May 10, 2002 sample period (+/- 3 days) in the Upper Mississippi River.

Pool 16 - Upper

Species	Main Channel	Main Channel Border
Catostomidae		0.002
Centrarchidae	0.001	0.002
<i>Cyprinus carpio</i>	0.016	0.021
Esocidae	0.001	
Hiodontidae	0.013	0.062
<i>Ictiobus/Carpionides</i>	0.161	0.098
Percidae	0.018	0.013
Unknown	0.009	0.004
Total Density (No./m³)	0.22	0.20

Pool 20 - Upper

Species	Main Channel	Main Channel Border
Catostomidae	0.003	0.004
<i>Cyprinus carpio</i>	0.003	0.014
Hiodontidae	0.010	0.003
<i>Ictiobus/Carpionides</i>	0.017	0.035
Percidae	0.003	0.010
Unknown		0.002
Total Density (No./m³)	0.04	0.07

Pool 22 - Upper

Species	Main Channel	Main Channel Border
Catostomidae	0.006	0.003
Centrarchidae		0.001
Clupeidae		0.001
<i>Cyprinus carpio</i>	0.007	0.031
Hiodontidae	0.004	0.018
<i>Ictiobus/Carpionides</i>	0.014	0.263
Percidae		0.021
Unknown	0.004	0.003
Total Density (No./m³)	0.03	0.34

Table 14. Diurnal (daytime) larval fish density expressed as No. fish/m³ for taxa collected during the May 20, 2002 sample period (+/- 3 days) in the Upper Mississippi River.

Pool 16				
Species	Lower		Upper	
	Main Channel	Main Channel Border	Main Channel	Main Channel Border
Catostomidae	0.003			0.001
Centrarchidae	0.002	0.001	0.001	
<i>Cyprinus carpio</i>	0.006	0.015	0.016	0.018
Cyprinidae		0.001	0.001	
Hiodontidae	0.005	0.004	0.016	0.004
<i>Ictiobus/Carpionides</i>	0.129	0.042	0.062	0.027
Percidae	0.020	0.007	0.015	0.006
<i>Polyodon spathula</i>			0.001	
Unknown	0.003	0.004	0.007	0.001
Total Density (No./m³)	0.17	0.07	0.12	0.06

Pool 20				
Species	Lower		Upper	
	Main Channel	Main Channel Border	Main Channel	Main Channel Border
<i>Cyprinus carpio</i>	0.001	0.004	0.006	0.009
Hiodontidae	0.006	0.062	0.035	0.088
<i>Ictiobus/Carpionides</i>	0.035	0.029	0.046	0.075
Percidae	0.004	0.004	0.001	0.005
Unknown				0.001
Total Density (No./m³)	0.05	0.10	0.09	0.18

Pool 22				
Species	Lower		Upper	
	Main Channel	Main Channel Border	Main Channel	Main Channel Border
Catostomidae	0.003			
Centrarchidae	0.003	0.001		
<i>Cyprinus carpio</i>	0.005	0.034	0.008	0.014
Hiodontidae	0.014	0.058	0.006	0.116
<i>Ictiobus/Carpionides</i>	0.024	0.083	0.034	0.058
Percidae	0.004		0.001	0.003
Unknown	0.003	0.001	0.004	0.003
Total Density (No./m³)	0.06	0.18	0.05	0.19

Table 15. Nocturnal (nighttime) larval fish density expressed as No. fish/m³ for taxa collected during the May 20, 2002 sample period (+/- 3 days) in the Upper Mississippi River.

Pool 16 - Upper

Species	Main Channel	Main Channel Border
Catostomidae		0.002
Centrarchidae	0.005	0.002
<i>Cyprinus carpio</i>	0.028	0.024
Cyprinidae	0.001	0.001
Hiodontidae	0.004	0.020
<i>Ictiobus/Carpiones</i>	0.132	0.118
Percidae	0.012	0.014
Unknown	0.002	0.005
Total Density (No./m³)	0.19	0.18

Pool 20 - Upper

Species	Main Channel	Main Channel Border
Catostomidae		0.001
<i>Cyprinus carpio</i>	0.011	0.018
Cyprinidae	0.001	
Hiodontidae	0.009	0.137
<i>Ictiobus/Carpiones</i>	0.061	0.074
Percidae		0.003
<i>Polydon spathula</i>		0.001
Unknown	0.003	0.003
Total Density (No./m³)	0.08	0.24

Pool 22 - Upper

Species	Main Channel	Main Channel Border
Catostomidae	0.004	0.001
Centrarchidae		0.001
<i>Cyprinus carpio</i>		0.025
Hiodontidae	0.010	0.118
<i>Ictiobus/Carpiones</i>	0.017	0.123
Percidae	0.001	0.003
Unknown		0.004
Total Density (No./m³)	0.03	0.28

Table 16. Diurnal (daytime) larval fish density expressed as No. fish/m³ for taxa collected during the June 5, 2002 sample period (+/- 3 days) in the Upper Mississippi River.

Pool 16				
Species	Lower		Upper	
	Main Channel	Main Channel Border	Main Channel	Main Channel Border
Catostomidae	0.007	0.005		0.006
Centrarchidae	0.032	0.015	0.006	0.046
Clupeidae	0.081	0.005	0.010	0.015
<i>Cyprinus carpio</i>	0.316	0.113	0.117	0.256
Cottidae		0.001		
Cyprinidae	0.759	0.066	0.099	0.064
Hiodontidae	0.004		0.002	0.001
<i>Ictiobus/Carpiodes</i>	0.037	0.006	0.006	0.018
<i>Morone</i> sp.	0.002		0.006	0.002
Percidae	0.011	0.014	0.002	0.013
Sciaenidae	1.567	0.140	0.383	0.086
Unknown	0.055	0.009	0.006	0.009
Total Density (No./m³)	2.87	0.37	0.64	0.52

Pool 20				
Species	Lower		Upper	
	Main Channel	Main Channel Border	Main Channel	Main Channel Border
Catostomidae	0.016	0.029	0.015	0.032
Centrarchidae	0.007	0.004	0.007	0.004
Clupeidae	0.012	0.162	0.024	0.071
<i>Cyprinus carpio</i>	0.047	0.050	0.057	0.075
Cyprinidae	0.145	1.878	0.901	3.037
Hiodontidae	0.026	0.020	0.019	0.010
<i>Ictiobus/Carpiodes</i>	0.038	0.050	0.301	0.103
<i>Morone</i> sp.	0.017	0.028	0.061	0.009
Percidae	0.012	0.025	0.010	0.007
Sciaenidae	0.517	3.549	4.292	9.804
Unknown	0.002	0.006	0.019	0.012
Total Density (No./m³)	0.84	5.80	5.71	13.16

Pool 22				
Species	Lower		Upper	
	Main Channel	Main Channel Border	Main Channel	Main Channel Border
Catostomidae	0.302	0.254	0.260	0.089
Centrarchidae	0.001	0.007	0.002	0.036
Clupeidae	0.033	0.029	0.088	0.168
<i>Cyprinus carpio</i>	0.001	0.003	0.012	0.004
Cyprinidae	3.502	3.724	0.569	1.151
Hiodontidae	0.004	0.007	0.036	0.010
<i>Ictiobus/Carpiodes</i>	0.004	0.052	0.052	0.135
<i>Morone</i> sp.	0.004	0.014	0.015	0.038
Percidae	0.001	0.001	0.004	0.017
Sciaenidae	9.532	3.678	1.053	0.442
Unknown	0.172	0.066	0.032	0.044
Total Density (No./m³)	13.56	7.84	2.12	2.13

Table 17. Diurnal (daytime) larval fish density expressed as No. fish/m³ for taxa collected during the June 19, 2002 sample period (+/- 3 days) in the Upper Mississippi River.

Pool 16				
Species	Lower		Upper	
	Main Channel	Main Channel Border	Main Channel	Main Channel Border
Catostomidae				0.001
Centrarchidae	0.019	0.014	0.021	0.023
Clupeidae	0.041	0.049	0.022	0.052
<i>Cyprinus carpio</i>	0.001	0.016	0.002	0.032
Cyprinidae	0.571	0.704	0.573	0.552
Hiodontidae	0.006	0.001	0.002	0.001
<i>Ictiobus/Carpionodes</i>	0.002	0.012	0.002	0.024
<i>Morone</i> sp.	0.013	0.011	0.009	0.006
Percidae		0.002	0.001	
<i>Polyodon spathula</i>			0.001	
Sciaenidae	1.424	0.279	0.953	0.286
Unknown		0.002		
Total Density (No./m³)	2.08	1.09	1.59	0.98

Pool 20				
Species	Lower		Upper	
	Main Channel	Main Channel Border	Main Channel	Main Channel Border
Catostomidae	0.001	0.006		0.008
Centrarchidae	0.001	0.001	0.004	0.001
Clupeidae	0.027	0.145	0.038	0.861
<i>Cyprinus carpio</i>	0.016	0.015	0.001	0.014
Cyprinidae	0.087	0.131	0.111	0.346
Hiodontidae	0.006	0.005	0.003	0.002
<i>Ictiobus/Carpionodes</i>	0.003	0.025	0.027	0.105
<i>Morone</i> sp.		0.005	0.007	0.015
Percidae				0.001
Sciaenidae	1.726	1.474	1.791	1.369
Unknown	0.010	0.003		0.010
Total Density (No./m³)	1.88	1.81	1.98	2.73

Pool 22				
Species	Lower		Upper	
	Main Channel	Main Channel Border	Main Channel	Main Channel Border
Catostomidae		0.003	0.007	0.002
Centrarchidae	0.004	0.003	0.001	0.007
Clupeidae	0.013	0.116	0.002	0.048
<i>Cyprinus carpio</i>	0.032	0.210	0.029	0.140
Cyprinidae	0.068	0.385	0.121	0.368
Hiodontidae	0.003	0.003	0.002	0.028
<i>Ictiobus/Carpionodes</i>	0.020	0.064	0.028	0.052
<i>Morone</i> sp.	0.003	0.002		0.001
Percidae		0.001		0.003
<i>Pylodictus olivaris</i>		0.001		
Sciaenidae	0.561	0.847	0.997	2.048
Unknown	0.001	0.008	0.007	0.009
Total Density (No./m³)	0.70	1.64	1.20	2.71

Table 18. Nocturnal (nighttime) larval fish density expressed as No. fish/m³ for taxa collected during the June 19, 2002 sample period (+/- 3 days) in the Upper Mississippi River.

Pool 16 - Upper

Species	Main Channel	Main Channel Border
Catostomidae	0.088	0.039
Centrarchidae	0.004	0.007
Clupeidae	0.003	0.084
<i>Cyprinus carpio</i>	0.030	0.041
Cyprinidae	1.281	1.147
Hiodontidae		0.001
<i>Ictiobus/Carpionodes</i>	0.034	0.069
<i>Morone</i> sp.	0.003	0.006
Sciaenidae	0.818	0.563
Unknown	0.001	0.002
Total Density (No./m³)	2.26	1.96

Pool 20 - Upper

Species	Main Channel	Main Channel Border
Catostomidae	0.005	0.002
Centrarchidae		0.002
Clupeidae	0.003	0.221
<i>Cyprinus carpio</i>	0.004	0.010
Cyprinidae	0.263	0.294
Hiodontidae	0.003	
<i>Ictiobus/Carpionodes</i>	0.035	0.155
<i>Morone</i> sp.	0.003	0.004
Percidae		0.001
<i>Polydon spathula</i>		0.001
Sciaenidae	0.885	0.633
Unknown	0.002	0.010
Total Density (No./m³)	1.20	1.33

Pool 22 - Upper

Species	Main Channel	Main Channel Border
Catostomidae	0.002	0.001
Centrarchidae	0.002	0.003
Clupeidae	0.002	0.041
<i>Cyprinus carpio</i>	0.017	0.104
Cyprinidae	0.045	0.644
Hiodontidae		0.005
<i>Ictalurus punctatus</i>		0.001
<i>Ictiobus/Carpionodes</i>	0.028	0.091
<i>Morone</i> sp.		0.004
Percidae		0.001
<i>Polydon spathula</i>	0.001	
Sciaenidae	0.084	0.452
Unknown	0.003	0.002
Total Density (No./m³)	0.18	1.35

Table 19. Diurnal (daytime) larval fish density expressed as No. fish/m³ for taxa collected during the July 17, 2002 sample period (+/- 3 days) in the Upper Mississippi River.

Pool 16				
Species	Lower		Upper	
	Main Channel	Main Channel Border	Main Channel	Main Channel Border
Catostomidae	0.006	0.004		0.000
Centrarchidae	0.001	0.003	0.005	0.010
Clupeidae	0.002	0.003	0.001	
<i>Cyprinus carpio</i>	0.001	0.002	0.072	0.046
Cyprinidae	1.318	0.805	0.373	0.338
<i>Ictiobus/Carpionides</i>	0.001		0.001	0.003
Sciaenidae	0.760	0.264	0.037	0.033
Unknown	0.030	0.004	0.006	0.002
Total Density (No./m³)	2.12	1.08	0.49	0.43

Pool 20				
Species	Lower		Upper	
	Main Channel	Main Channel Border	Main Channel	Main Channel Border
Catostomidae	0.015	0.010		0.005
Centrarchidae	0.015	0.004	0.008	0.007
Clupeidae	0.017	0.007	0.108	0.025
<i>Cyprinus carpio</i>	0.005	0.005	0.003	0.001
Cyprinidae	0.140	0.581	0.317	0.335
<i>Ictiobus/Carpionides</i>	0.003	0.000	0.001	0.004
Sciaenidae	0.180	0.502	0.672	0.455
Unknown	0.004	0.001	0.001	0.006
Total Density (No./m³)	0.38	1.11	1.11	0.84

Pool 22				
Species	Lower		Upper	
	Main Channel	Main Channel Border	Main Channel	Main Channel Border
Catostomidae	0.001	0.001	0.005	0.004
Centrarchidae	0.008	0.003	0.002	0.007
Clupeidae	0.002	0.009	0.005	0.008
<i>Cyprinus carpio</i>	0.002	0.005	0.006	0.012
Cyprinidae	0.169	0.106	0.226	0.498
<i>Ictiobus/Carpionides</i>		0.004	0.002	0.003
Percidae				0.000
Sciaenidae	1.249	0.809	1.321	1.335
Unknown	0.003	0.004	0.003	0.001
Total Density (No./m³)	1.43	0.94	1.57	1.87

Table 20. Larval fish density expressed as No. fish/m³ for taxa collected during the May 10, 2002 24-hour sample period (+/- 3 days) in the Upper Mississippi River.

0600

Species	Main Channel	Main Channel Border
Catostomidae	0.010	0.008
Centrarchidae		0.002
<i>Cyprinus carpio</i>	0.008	0.010
Cyprinidae		0.002
Hiodontidae	0.001	0.023
<i>Ictiobus/Carpiones</i>	0.068	0.081
Percidae	0.008	0.020
Unknown	0.001	0.007
Total Density (No./m³)	0.10	0.15

1200

Species	Main Channel	Main Channel Border
Catostomidae	0.031	0.049
Centrarchidae		0.003
<i>Cyprinus carpio</i>	0.011	0.006
Cyprinidae		0.001
Hiodontidae		0.042
<i>Ictiobus/Carpiones</i>	0.066	0.054
Percidae	0.024	0.017
Unknown	0.011	0.007
Total Density (No./m³)	0.14	0.18

1800

Species	Main Channel	Main Channel Border
Catostomidae	0.049	0.001
Centrarchidae	0.001	0.002
<i>Cyprinus carpio</i>	0.013	0.004
Hiodontidae	0.006	0.051
<i>Ictiobus/Carpiones</i>	0.092	0.166
Percidae	0.019	0.015
Unknown	0.009	0.008
Total Density (No./m³)	0.19	0.25

2400

Species	Main Channel	Main Channel Border
Catostomidae		0.002
Centrarchidae	0.001	0.002
<i>Cyprinus carpio</i>	0.016	0.021
Esocidae	0.001	
Hiodontidae	0.013	0.062
<i>Ictiobus/Carpiones</i>	0.161	0.098
Percidae	0.018	0.013
Unknown	0.009	0.004
Total Density (No./m³)	0.22	0.20

Table 21. Larval fish density expressed as No. fish/m³ for taxa collected during the May 21, 2002 24-hour sample period (+/- 3 days) in the Upper Mississippi River.

0600

Species	Main Channel	Main Channel Border
Centrarchidae		0.001
<i>Cyprinus carpio</i>	0.023	0.029
Hiodontidae	0.005	0.008
<i>Ictiobus/Carpiones</i>	0.140	0.044
Percidae	0.005	0.008
Unknown	0.005	0.004
Total Density (No./m³)	0.18	0.09

1200

Species	Main Channel	Main Channel Border
Catostomidae		0.001
Centrarchidae	0.001	
<i>Cyprinus carpio</i>	0.016	0.017
Cyprinidae	0.001	
Hiodontidae	0.016	0.004
<i>Ictiobus/Carpiones</i>	0.062	0.025
Percidae	0.015	0.006
<i>Polydon spathula</i>	0.001	
Unknown	0.007	0.001
Total Density (No./m³)	0.12	0.05

1800

Species	Main Channel	Main Channel Border
Catostomidae	0.003	0.001
Centrarchidae	0.003	
<i>Cyprinus carpio</i>	0.035	0.011
Hiodontidae	0.004	0.001
<i>Ictiobus/Carpiones</i>	0.126	0.049
Percidae	0.006	0.007
Unknown	0.001	0.003
Total Density (No./m³)	0.18	0.07

2400

Species	Main Channel	Main Channel Border
Catostomidae		0.002
Centrarchidae	0.005	0.002
<i>Cyprinus carpio</i>	0.028	0.024
Cyprinidae	0.001	0.001
Hiodontidae	0.004	0.020
<i>Ictiobus/Carpiones</i>	0.132	0.118
Percidae	0.012	0.014
Unknown	0.002	0.005
Total Density (No./m³)	0.19	0.18

Table 22. Larval fish density expressed as No. fish/m³ for taxa collected during the June 20, 2002 24-hour sample period (+/- 3 days) in the Upper Mississippi River.

0600		
Species	Main Channel	Main Channel Border
Catostomidae	0.001	0.004
Centrarchidae	0.030	0.022
Clupeidae	0.020	0.050
<i>Cyprinus carpio</i>	0.005	0.017
Cyprinidae	0.549	1.056
Hiodontidae	0.005	
<i>Ictiobus/Carpiodes</i>	0.002	0.041
<i>Morone</i> sp.	0.013	0.012
Sciaenidae	2.457	0.312
Unknown	0.001	0.002
Total Density (No./m³)	3.08	1.52

1200		
Species	Main Channel	Main Channel Border
Catostomidae		0.001
Centrarchidae	0.021	0.023
Clupeidae	0.022	0.052
<i>Cyprinus carpio</i>	0.002	0.032
Cyprinidae	0.573	0.552
Hiodontidae	0.002	0.001
<i>Ictiobus/Carpiodes</i>	0.002	0.024
<i>Morone</i> sp.	0.009	0.006
Percidae	0.001	
<i>Polydon spathula</i>	0.001	
Sciaenidae	0.953	0.286
Total Density (No./m³)	1.59	0.98

1800		
Species	Main Channel	Main Channel Border
Catostomidae	0.002	0.000
Centrarchidae	0.004	0.015
Clupeidae	0.007	0.110
<i>Cyprinus carpio</i>	0.015	0.016
Cyprinidae	1.168	0.909
<i>Ictiobus/Carpiodes</i>	0.006	0.012
Lepisosteidae		0.000
<i>Morone</i> sp.	0.007	0.005
Percidae		0.002
Sciaenidae	1.125	0.646
Unknown		0.001
Total Density (No./m³)	2.33	1.72

2400		
Species	Main Channel	Main Channel Border
Catostomidae	0.088	0.039
Centrarchidae	0.004	0.007
Clupeidae	0.003	0.084
<i>Cyprinus carpio</i>	0.030	0.041
Cyprinidae	1.281	1.147
Hiodontidae		0.001
<i>Ictiobus/Carpiodes</i>	0.034	0.069
<i>Morone</i> sp.	0.003	0.006
Sciaenidae	0.818	0.563
Unknown	0.001	0.002
Total Density (No./m³)	2.26	1.96

Table 23. Mean lengths (mm) and length ranges of larval fish collected from Pool 16 of the Upper Mississippi River, 2002.

Species	April		May		June		July	
	Mean	(Min - Max)	Mean	(Min - Max)	Mean	(Min - Max)	Mean	(Min - Max)
Catostomidae	6.38	(5-7)	6.78	(4-13)	4.09	(3-19)	3.07	(3-4)
Centrarchidae	4.83	(4-6)	5.42	(4-7)	5.57	(4-11)	5.94	(4-12)
Clupeidae	5.00	N/A			7.49	(4-19)	18.75	(9-27)
Cottidae					7.00	N/A		
<i>Cyprinus carpio</i>	6.71	(5-8)	6.95	(5-12)	7.91	(5-19)	6.24	(4-7)
Cyprinidae	5.80	(5-7)	7.00	(4-9)	5.58	(4-8)	6.61	(4-17)
Esocidae			10.00	N/A				
Hiodontidae	7.80	(7-9)	10.63	(7-14)	16.89	(11-26)		
<i>Ictiobus/Carpiodes</i> sp.	6.76	(5-8)	7.74	(6-12)	7.54	(4-15)	6.78	(6-7)
Lepisostidae					23.00	N/A		
<i>Morone</i> sp.					11.09	(3-18)		
Percidae	5.77	(4-9)	6.06	(4-11)	7.12	(4-20)		
<i>Polydon spathula</i>			8.00	N/A	7.00	N/A		
Sciaenidae					6.05	(3-12)	4.28	(4-5)

Table 24. Mean lengths (mm) and length ranges of larval fish collected from Pool 20 of the Upper Mississippi River, 2002.

Species	April		May		June		July	
	Mean	(Min - Max)	Mean	(Min - Max)	Mean	(Min - Max)	Mean	(Min - Max)
Catostomidae	6.34	(5-9)	5.79	(4-9)	5.46	(3-20)	3.24	(3-11)
Centrarchidae					5.92	(4-16)	5.89	(4-18)
Clupeidae	5.00	N/A			10.50	(4-22)	19.89	(5-27)
<i>Cyprinus carpio</i>	6.42	(5-7)	7.08	(5-10)	7.54	(5-22)	7.14	(6-12)
Cyprinidae	6.33	(5-8)	5.00	N/A	5.67	(3-12)	7.67	(4-21)
Hiodontidae	10.00	N/A	12.15	(7-14)	14.83	(10-31)		
<i>Ictiobus/Carpionodes</i> sp.	7.59	(6-10)	7.63	(5-10)	7.34	(4-14)	8.23	(5-14)
<i>Morone</i> sp.					8.33	(4-23)		
Percidae	6.05	(4-9)	6.74	(4-15)	5.89	(4-21)		
<i>Polydon spathula</i>			11.00	N/A	8.00	N/A		
Sciaenidae					5.95	(4-14)	4.90	(4-7)

Table 25. Mean lengths (mm) and length ranges of larval fish collected from Pool 22 of the Upper Mississippi River, 2002.

Species	April		May		June		July	
	Mean	(Min - Max)	Mean	(Min - Max)	Mean	(Min - Max)	Mean	(Min - Max)
Catostomidae	6.08	(3-9)	6.71	(5-10)	4.98	(3-19)	3.94	(3-18)
Centrarchidae	5.00	N/A	6.50	(4-10)	7.09	(4-15)	7.17	(4-14)
Clupeidae			8.00	(6-10)	6.70	(4-19)	18.47	(6-25)
<i>Cyprinus carpio</i>	6.26	(4-9)	7.48	(5-13)	7.95	(5-20)	6.84	(6-8)
Cyprinidae	7.58	(4-10)	5.86	(5-7)	6.25	(4-14)	7.07	(5-23)
Hiodontidae			11.89	(7-15)	13.83	(6-28)		
<i>Ictalurus punctatus</i>					21.00	N/A		
<i>Ictiobus/Carpionodes</i> sp.	7.26	(4-10)	7.46	(5-10)	7.29	(5-12)	7.13	(6-10)
<i>Morone</i> sp.					5.95	(4-15)		
Percidae	7.16	(4-10)	7.39	(4-12)	5.95	(4-12)	6.00	N/A
<i>Polydon spathula</i>					11.00	N/A		
<i>Pylodictis olivaris</i>					10.00	N/A		
Sciaenidae					6.06	(4-17)	5.22	(3-12)